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[We regret extremely that the controversy between Messrs. Detmold and Johnson has assumed so unpleasant a character, as it is not our desire that professional discussion should degenerate into personal disagreement. As both of the gentlemen have disclaimed any intention of continuing the discussion, and as we desire to exclude topics of an unpleasant character, we close the matter, and hope that any disagreeable recollections of it may be sunk in oblivion.]

To the Editors of the American Railroad Journal.

GENTLEMEN,—I have no intention of making the pages of your Journal the arena for personal discussion, but after the communication from Mr. E. F. Johnson, to which you gave publicity in your last number, I feel it incumbent on myself to say one word more, and the last.

The sole object I had in view, when I entered into controversy with Messrs. Johnson and Talcott, was to support the truth of the principles of action of Locomotive Engines, and the formulæ for determining their power, as deduced by De Pambour. I regret that my well-meant effort to convince Mr. Johnson of his erroneous views on this subject should have failed; he persists in his groundless, though confident, assertions of the correctness of his position, and the fallacy of De Pambour, and supports them by a profuse outpouring of personal invective against myself.

His attempt to cast upon me, in almost every paragraph of his last communication, the stigma of having stated what was not true, does not controvert a single one of the demonstrations which I have employed to show his misconception of the subject, and the correctness of De Pambour. Yet, if he can succeed, by quibbling evasions and forced constructions, in convincing any one that I have misstated his positions, he is welcome to the full benefit of such a mode of conducting an argument. My aim throughout the discussion was a higher one than to prove him wrong; all I wished was to prove De Pambour right, and in this I believe I have succeeded.

Mr. Johnson's concluding appeal for a judgment in his favor, on the ground of my being of foreign birth, is a puerility I need hardly advert to. I now dismiss the subject altogether, and those of your readers who feel an interest in the discussion, I must refer to my former communications.

C. E. DETMOLD.

(Communicated by the Chevalier Von Gerstner.)

Cost of Working Railroads compared with Canals or Turnpike Roads.

In the greater part of Treatises on Railroads, the object of constructing them is exposed with all the necessary detail, but the expenses for working a finished Railroad Line have, as yet, not been determined by experience. We have, therefore, been much gratified in overlooking the 3d edition of the "Practical Treatise on Railroads, by Nicholas Wood," lately published in London; Mr. Wood gives a very good analysis of the different items of expenses in working a Railroad, and takes, as an example, the Liverpool and Manchester Railway. This line is 30 miles long, but equal to a level Railroad of 34½ miles in length. The following table contains the cost of working this line for a period of two and a half years, during which the Directors of the Railroad Company published detailed reports:

Cost of Working the Liverpool and Manchester Railroad, from January 1, 1832, to July 1, 1834.

Heads of charge.	Merchandize per ton per mile		Passengers.		Aggregate cost per ton per mile.	
	of goods	Gross load.	Per passen. per mile.	Per ton per mile gross.	Useful load of goods	Gross load.
	cents.	cents.	cents.	cents.	cents.	cents.
Locomotive power.....	0,994	0,651	0,546	1,320	1,320	0 922
Maintenance of way.....	0,555	0,421	0,172	0,421	0 555	0,421
Coaching — upholding carriages.	—	—	0,109	0,264	0,148	0,105
Coaching — conducting coach'g	—	—	0,211	0,510	0,286	0,201
Coaching — duty on passengers	—	—	0,144	0,390	—	—
Car'ng goods — upholding waggons	0,410	0,287	—	—	0,170	0,121
Car'ng goods — conducting traffic	1,953	1,374	—	—	0,837	0,586
General expenses.....	0,640	0,448	0,184	0,448	0,640	0,448
Total cost.....	4,552	3,181	1,366	3,353	3,956	2,804

In making the reduction, we took £1 st. equal to 4 dollars 86 cents, and the American ton equal to 2000 English pounds. The gross load is that of goods and waggons, or passengers and cars.

The second table contains the *cost of conveying goods and passengers on turnpike roads.*

Description of carriage.	Rate of traveling in miles per hour.	Resistance per ton on a level.	Cost of haulage per ton per mile.	Cost of conveyance.
		lbs.	cents.	
Stage waggon...	2½	65	5,4	14½ cents per ton per mile
Van or light car.	4	65	8,1	21,7 cents per ton per mile
Stage coach....	9	74	18,1	6,1 cents per passeng. "

The next table contains the *cost of conveying goods and passengers on canals, at different rates of speed.*

Description of boats.	Rate of speed in mile pr hour	Resistance per ton in lbs.	Cost of haulage per on per mile.	Cost of boat hire &c. per ton per mile.	General expenses per ton pr mile.	Aggregate charges.	
						Useful load pr ton pr mile	Gross load pr ton pr mile.
	miles.	lbs.	cents.	cents.	cents.	cents.	cents.
Slow boats.....	$2\frac{1}{2}$	2,44	0,33	0,58	1,55	2,46	1,84
Fly boats.....	4	6,31	0,90	1,19	4,27	6,36	4,11
Swift boats.....	10	50,71	0,557 pr passeng 6,328 prton pr m	——	17,54	2,19 per passenger 23,96 per ton	18,08 per ton.

It is evident, that in every Railroad project, besides the expenses of construction, those of working the line are of the highest importance. In giving, therefore, the above statements, we wish to induce the Engineers and Superintendents of our Railroads to make similar accounts at the end of every six months, or every year. These accounts will show in a very clear way the state of their concern, and give at the same time, very important data for new projects. We would be very much pleased to receive some of those accounts for publication in our Journal.

Report from J. J. Abert, in reference to a Canal to connect the Chesapeake and Ohio Canal with the City of Baltimore.

To his Excellency T. W. Veazey, Governor of the State of Maryland.

1. In consequence of the application of your Excellency, dated the 23d of April, 1838, to the honorable Secretary of War, I was directed to receive your instructions, and to carry them into effect. These referred to a survey of a route for a canal to connect the Chesapeake and Ohio canal with the city of Baltimore, and will be found more particularly expressed in two of a series of resolutions passed by the Legislature of the State of Maryland, in March, 1838, in the following words:

"*Resolved*, That the Maryland Canal Company are entitled to no subscription on the part of this State, under the provisions of this act of the Assembly, unless they will agree to locate the canal from the Chesapeake and Ohio canal to the city of Baltimore by the most northern practicable route of the routes by the valleys of the Monococy and the Patapsco, or by the route diverging from the said Chesapeake and Ohio canal, at the mouth of the Seneca river, exclusively within the limits of this State, provided such route be found practicable with due supply of water."

"*Resolved*, That the Governor be, and he is hereby authorized to direct a survey to be made of the aforesaid routes, so that the practicability of constructing the said canal, by either of the said routes, may be ascertained at as early a period as possible; and report the same to the next General Assembly."

2 From the foregoing it will be perceived that the locality of the routes of the canal is prescribed; that, whichever route should be adopted, it must be exclusively within the limits of the State of Maryland; and that it should be "practicable with due supply of water,"

3. Several surveys having already been made in reference to the same

object, by engineers of much reputation, the possibilities of the case had become determined; so that my attention was, in the outset, limited, and relieved from the vague action which would have ensued of an unknown and unsurveyed region. These previous surveys confined those possibilities to three routes, usually known as—

1. *The Westminster route.*
2. *The Linganore route.*
3. *The Seneca route.*

There is a fourth also—the route through the District of Columbia to Georgetown; but as this is not "exclusively within the limits of the State of Maryland," it could not be made a subject of investigation, as it fell without the locality of operations which the Legislature had directed to be observed.

4. Of the routes named, the first had been so unequivocally rejected by the engineers who had preceded me, that I did not consider it deserving of a survey. The second had also been rejected, from its presumed deficiency in water; but as it was the only route connecting with the valley of the Monococy that had a bare possibility in its favor, and as the Legislature evidently had this valley in their contemplation when the resolutions quoted were passed, it appeared to me proper that it should be surveyed. It has accordingly been done.

5. The third is the route by the valley of the Seneca. Upon this, and this alone, have the engineers who preceded me differed in opinion. One, Mr. Trimble, declaring it to be adequately supplied with water; the other two, Messrs. Fisk and Hughes, being equally decided that the supply was insufficient. It was this difference of opinion which gave rise to the legislative action authorizing renewed surveys, and which induced your excellency to designate me as a sort of umpire in the case, with authority to make whatever additional investigations and surveys might be considered necessary.

6. I will not deny that I felt the embarrassment of my position. With all of these gentlemen I had been for years on terms of the most friendly intercourse. All possessed great reputation. Mr. Trimble, a distinguished graduate of the Military Academy, had been, for many years, superintending highly important railroad operations, possessing and deserving the confidence of his employers. Mr. Fisk had been equally long on those of canals, and was then, and had been for some time previous, the Chief Engineer of the Chesapeake and Ohio canal. Mr. Hughes, his associate, it was well known, was a gentleman of scientific knowledge, having passed through the courses of the Military Academy, of a vigorous and inquiring mind, and had been for many years employed by the United States as a civil engineer, in which capacity his reports, plans, and estimates, on various subjects connected with his profession, bear ample testimony of his abilities. To agree with both sides was impossible; to differ with some one, therefore, must be the inevitable result of an honest opinion.

7. On entering upon the duty, it was soon found proper to extend the surveys much more in detail than had been at first contemplated, as well to gather all facts of importance bearing upon the question at issue, as from the difficulty of accurately connecting ours with the labors of our predecessors, from the deficiency of permanent marks. But I hope by this course that all necessary matter has been collected, so that the question will be satisfactorily settled.

8. Your excellency was duly apprized, in the outset, that it would not

be in my power to give much personal attention to the surveys. These were, however, committed to able hands—Mr. Thomas J. Lee being at the head of one party, and Mr. J. P. Kirkwood of the other. The intercourse between these gentlemen and myself has been frequent, personally and by letter, so that no benefit that could be derived from my advice has been withheld.

9. Recurring to your excellency's letters and instructions, and to the resolutions of the Legislature, as well as to the general principle which governs in all canal cases, it will be seen that the point at issue is "the due supply of water;" and that this is, in fact, the sole point upon which I am required to report.

10. It will involve a reasoning upon the general question of the quantity of water consumed or expended by canals, upon which it is evident that one might indulge oneself in a long essay, but of matters familiar to the profession, already treated with great ability by engineers, and which in consequence, would leave me, at most, only the subordinate duty of repeating, in my own language, that which has been so much better said by others. To the professional man, therefore, I shall probably say nothing either new or interesting; and were I writing a report for his perusal only, I should probably limit myself to a few results and deductions; but writing, as I am for the judgment of the Legislature, which is not professional, I shall, of necessity, be forced into the discussion of details familiar to the profession, but not so to those for whom I write. And to be the better appreciated by these, I shall endeavour to express myself in that simple and plain language which, if it should not convince, will at least be understood.

11. The water required for a canal ought to be sufficient to supply an expenditure on the following accounts:

1st. To fill the canal throughout its whole extent.
2d. To compensate for losses from evaporation.
3d. To compensate for losses from filtration and absorption.
4th. To compensate for losses from leakage at the lock-gates.
5th. For the uses of the locks, according to the demands of the trade upon the canal.
6th. And for the waste arising from accidents and negligencies.

12. I mean to treat of these several causes of expense of water as briefly as a clear exposition of each will admit; and shall endeavour, in that way, to establish certain general rules, which may be afterwards easily applied, by any one who has a knowledge of the rudiments of arithmetic, to the particular project under examination.

13. But, as accessory structures to canals, feeders and reservoirs have to be made, some facts and reasonings in reference to losses of water in these, and of the means of filling reservoirs, will likewise have to be submitted.

14. 1st. *The quantity required to fill the canal.*—This, of necessity, depends upon its dimensions—length, breadth, and depth, and is obtained by resolving them into the cubic unit of water used in the calculation. The result is, however, always below the truth; because, while the process of filling is going on, losses from evaporation, absorption, and filtration are taking place. In strictness, therefore, these should be taken into account, particularly in cases in which the supply not being abundant, it would be dangerous, from the delusion probably consequent, to neglect any item of loss.

15. 2d. *Losses from evaporation.*—Much has been written on evaporation by authors, as a philosophical question; but it is evident, on an examination of their experiments, that the result obtained can form no good data for calculating losses of water from a similar cause on canals. What just comparison can be made between the circumstances of experiments in a laboratory, and those which exist on a canal? The one, exposed to all the changes of temperature in different parts of its surface; to commotion in its waters; to continual variations of humidity in the adjacent bed of air; and to greater or less currents of air passing over its surface. From all these, the experiments of most writers on the subject have been comparatively free, and, of consequence, their results are not safe data in reasoning upon evaporation on canals. One can easily be satisfied of this by referring to the article on "evaporation," in Hutton's Mathematical Dictionary, and by reducing to arithmetical results the proportions which some have endeavoured to establish between evaporation and rain, and the reverse. These proportions, if true in nature, can be so only in peculiar localities: as, for instance, Dr. Brownrigg, in his treatise upon making salt, states the evaporation in some parts of England at 73·8 inches during the months of May, June, July and August; and at 140 inches for the whole year! To what conclusions would these facts lead us, were we to apply them in the proportions given by authors between evaporation and rain?

16. Also, Mr. Dalton found that from the current occasioned by merely raising a window, the evaporation of his experiments in the room in which they were made was increased fifty per cent.! Surely such results are not to be applied to the condition of water in a canal.

17. That settled proportions exist between evaporation and rain, is not what I mean to dispute; but to determine these for an extensive district of country requires numerous and long continued observations in many places, under circumstances brought as nearly as possible to those which actually exist in a state of nature. Proportions can, without doubt, be correctly established between the evaporation of a laboratory, and rain as it naturally and actually occurs. But, then, what are those proportions? Merely such as exist in the evaporation of a laboratory on the one side, and rain in a state of nature on the other! Now, for a canal, we want the evaporation of a state of nature. That determined at salt-works, where artificial heat is not used, but merely the evaporation from large and exposed vats by the air, is most probably the nearest approximation to what actually occurs on a canal, differences of climate and temperature being considered.

18. I have been furnished by my enlightened friend, Dr. Harlan, of Philadelphia, with some results of evaporation in that city. But these are liable to the objections already stated; there is no parallelism of circumstances with those of a canal, and therefore there can he no just application of results.

19. I am convinced that losses on this account on canals much exceed the laboratory rules by which engineers have been governed, and that this has been often the unexpected cause of disappointment in the quantity of water anticipated.

20. Evaporations are much influenced by climate. That of England being generally colder and more moist than the climate of France, evaporation in the latter country should be greater than in England. In our country, particularly in the Middle States, we have more hot, dry, clear, and windy weather than in France; which would justify the inference of a

greater evaporation with us than in Europe. We have also more rain in the course of the year; that is, a greater quantity falls in fewer rainy days.

21. From the considerations heretofore given, I am disposed to consider the greater part of these rates of evaporation as inapplicable to the condition of water in a canal.

22. The celebrated engineer, Gauthey, in his interesting work upon canals, appears to rely in this question upon the experiments made by Mr. Cotte, at Montmorency, near Paris.

The method pursued in making the expèriments is not given by Gauthey, but the result is, that the mean evaporation per year amounts to 41,575 inches; and that, for parts of a year, (vol. I, 266,) the results were: for November, December, and January, 1·338 inches per month; for March, September, and October, 3·189 inches per month; and for the remaining six months, 5.315 inches per month. These were probably the results of some one year, as they do not agree with the average per year above stated. The same observer also found the rain to amount to 18·662 inches per year: from which he concludes that the evaporation is to rain about as 20 to 9, or as 5 to 2·25.

23. Dr. Halley fixes the annual evaporation at London at 48 inches; and, on an ordinary summer's day at two-tenths of an inch; and the proportion between that and rain as 5 to 3. The experiments of Dalton and Hoyle make it about 4·41 to 3.

24. By particular observations of the Engineer, M. Pinn, on evaporation, during the suspended navigation *(chomage)* on the Languedoc canal, (And. p. 223) he determined that the partial depression, owing to evaporation, was two-fifths of the total depression of the water held in reserve; and that, during 320 days of navigation, the mean height of the prism of water raised by evaporation from the surface of the canal was 812 millemetres, or 31·969 inches.

I understand this to refer to the actual exhaustion from the surface of the canal, exposed, at the same time, to whatever rain might fall upon it.

25. The quantity held in reserve, of which two-fifths were lost by evaporation, is not stated; but, if it were, as I suppose it to be, the full prism of water left on the closing of the navigation, the loss would then be one fifth of that prism in 20 days; which would be equivalent to one prism in one hundred days, or three and one-fifth prisms during the 320 days of navigation, from this cause alone.

26. But it was said that the total abatement of the waters in the canal, on account of evaporation, was 31·609 inches in 320 days. Now, taking the rain as given (And. p. 237) for Trebes, a central point of the canal, and for a moderately rainy year, as stated at 697 millemetres, or 27.44 inches, or 24·06 inches for the 320 days, we have the amount of rain which fell upon the surface of the canal, and restored, to that extent, losses from evaporation. But as, notwithstanding the rain, these losses were 31·969 inches, the two sums may be taken as the total evaporation, or 56·03 inches. As the time of 320 days includes that of filling, opening and closing the canal, I presume ten months may be taken for its actual navigation: this would give a sum of 5·60 inches for the average loss, by evaporation, per month.

27. We have seen that, for an ordinary summer day, for the climate of London, Dr. Halley states the evaporation to be two-tenths of an inch, which would be six inches for a month of 30 days. Now, taking our climate into consideration, where we have no cooler, and many hotter days than an ordinary summer day in England, from the middle of April

to the 1st of October, and the actual circumstances to which water in a canal is exposed, we believe but few engineers will consider the evaporation stated in the deduction just made as beyond the reality for the climate of the Languedoc canal, and still less so for the one to which our observations may be applied.

28. But further: In a table of the depth of rain from observations made by Mr. Brantz, of Baltimore, we find the mean annual fall of rain, in a series of eight years, to have been 39·89 inches, (Rep. Board of Engineers, p. 52). Applying Doctor Halley's rule of proportion (23) to this, it will give a mean evaporation of 66·48 inches. Then applying the rule resulting from the observations of Dalton and Hoyle, (23) the mean evaporation will be 58 638 inches. And now to the same quantity of rain, applying the proportion of Mr. Cotte, (22) the mean evaporation will be 88·64 inches. We have already stated our opinion that evaporation was greater in this country than in Europe. All the causes of the phenomenon are known to be more active with us, and we have seen that the results from the proportions given between rain and evaporation add their proofs to the opinion. Direct observations have been made in but few places within my knowledge.

29. Mr. Sullivan, in his report upon the Chesapeake and Ohio canal, states the annual evaporation at Salem (Mass.) at 56 inches; and the board of Engineers, in their report upon the Morris canal, in 1823, state that Mr. S. Williams had ascertained the evaporation at Cambridge (Mass.) to amount, annually, to 56 inches. Applying this result to the climate of the Morris canal, the board conclude to adopt 51 inches for its evaporation. "But, as the canal can be navigated only during those eight months of the year (from April to December) when the evaporation will be the greatest and the rain the least, and as the instruments in use for measuring evaporation must always give results below the truth, from their not being exposed to wind and currents of air, we therefore adopt the whole sum of 51 inches as expressive of the maximum loss of water by evaporation." Now, as this was for a navigation of eight months' duration, the loss by evaporation was assumed at 6·37 inches per month.

30. We have seen that the observations at Montmorency (22) gave an evaporation of 41·57; from which, if we deduct 2·66 for the two winter months, it will leave 38·91 inches for the remaining ten months. And we have also seen that the actual canal evaporation in that country amounted to 56·03 inches (26); from which one may deduce a ratio between the evaporation of the laboratory and that which exists on a canal: this will be found to be as 1 to 1·44. It will probably not be considered unreasonable to take the mean annual evaporation of the climate of Maryland, within the region of the contemplated canal, as equal to that of Cambridge (Mass.). Then, if we apply to the Cambridge evaporation (29) the proportion just ascertained, we may find the probable evaporation of the climate of our canal, for water exposed as it is in a canal. This will be 80·64 inches. Such is the mean annual evaporation, which, if we were to calculate for loss from that cause, we should use for a canal near Cambridge (Mass.) It could not, therefore, be expected that we should use less for one in the vicinity of Baltimore. The average would be 6·72 inches per month, and 67 20 inches for the ten months of navigation.

31. If our reasoning be correct, then, as a general rule for a climate like that of Baltimore, evaporation from large and exposed surfaces similar to those of a canal is to rain as 2·02 to 1.

32. We are fully aware that our reasoning upon this matter is speculative. The data being of that character, the reasoning must partake of the same. Our object is not to discredit the use of such rules, but to show the caution with which they should be applied.

33. But no rule of this kind can be relied upon: if true, it is but for some limited locality. Every proportion given by any authority is thrown into a kind of ridicule by the facts of some localities. In Cavallo's Philosophy, page 374, it is stated that, from accurate experiments made by Doctor Dobson, during four years, he determined the annual evaporation from the surface of the water at Liverpool to be 36·78 inches; and in page 378, the annual fall of rain at Liverpool is reported to be 37·48 inches. Now, taking either of these elements for calculation, we can readily perceive into what error we should fall, by the ratio or proportions given by any author between evaporation and rain. "The annual quantity of rain," says Dr. Dobson, "is a very uncertain test of the moisture or dryness of any particular season, situation, or climate. There may be little or no rain, and yet the air may be constantly damp and foggy; or there may be heavy rains, with a comparatively dry state of the atmosphere."

34. It is, then, also, a very uncertain test of the evaporation, or the evaporation of the rain. In so important a matter as a canal, the water should not be obtained by inference.

35. *Filtrations.*—These are the result of a general law of nature, acting with greater or less force, according to the peculiarities of soil, but acting unceasingly and universally; often at great depths, as is observed in mines and caves, in great force, as is known from the absorption of entire rivers; through apparently impervious strata, as has been observed through more than forty feet of the calcareous rock in which are cut the catacombs of Paris; and through carefully constructed masonry, as is to be seen on passing under our various aqueducts. The idea, therefore, of making a canal which should be exempt from this general law, would be an absurdity. The effort of the engineer is to lessen its activity, and to supply the losses which it occasions.

36. Gauthey, in his work on canals, (p. 267,) gives it as a general rule, that one may assume for filtration about double the amount of evaporation. This opinion follows immediately subsequent to his statement of M. de Cotte's rate of evaporation. But from the remarks which we have made upon losses from evaporation, and from the facts we have given, the uncertainty of such a rule must be evident. It appears to our judgment that it cannot be otherwise than incorrect. There are no acting causes common to both, so as to produce any uniform relation between them. Filtrations are the result of the soil through which the canal passes, and the greater or less care bestowed upon its construction. Now, it is clear that these have no connexion whatever with the causes of evaporation, and therefore, no rule of proportion can be assumed as existing between them. The evaporation in the same locality would remain the same, whether the canal were carefully or negligently made, or whether the soil were close or permeable. Such a rule can, therefore, be applied to a particular case only, and to that with propriety, merely because it has been found to be true from actual observation.

37. Most of the rules of French engineers have been derived from observations made on the Languedoc canal. Now, this canal, it is admitted by all who have written upon it, loses less from the usual causes of waste than any other known canal in the world, owing to the care

which had been infused in its construction, and the vigilance and intelligence with which it is superintended. Rules derived from such a source, should, therefore, be received with great caution. They led the great engineer I have just named into error in his project of the canal du Centre, and would have resulted in a complete failure if sources of supply of water, in addition to those at first relied upon, had not been at command.

38. But even in the Languedoc canal I have not been able to find in my investigations any data to justify the rule, as the annual loss from filtration given by authors much exceeds the amount which would be derived by calculation from double the evaporation. Some limited experiments on parts of the work would seem to sustain it; but these appear to me to be wanting in many facts to justify a general rule. There can be no doubt, however, that all the phenomena connected with canals have been observed with extreme care on this, the boast of France and the pride of her engineers. It is esteemed by the latter as one of the most interesting works of that kind. We shall have frequent occasion in our remarks to refer to facts connected with its history.

39. It is, among canals, perhaps the only one which furnishes distinct results of losses by filtration. The usual method is to combine these with those of evaporation in one common result, which answers all general purposes in forming a judgment of the supply of water required. But there can be no doubt, if observations on these and every cause of loss were separated and made distinctly, it would lead to a much greater accuracy, and would present in a more striking light the great saving of water which would ensue from the introduction of a better system of construction. Where canals have been made in our country, the supply of water has generally been abundant, and the demand for it on other accounts so limited, that we have been able to afford the waste of large quantites; it being a much cheaper plan than to save it at a great enhancement of cost.

40. Elements to which capital can be applied are not among our deficiencies, but rather capital in order to bring those elements into activity. This last is both scarce and in great demand; it has, therefore, to be used with the most vigilant economy. Hence has arisen with us a system of engineering, which may be emphatically called "the American system," which looks less to posterity than to our own time, and presses with extreme eagerness to an immediate and profitable result. It is a system in harmony with our condition, based upon common sense, and is the only one which, in our circumstances, can be pursued to any extent in the development of our immense but rather latent resources. While we therefore admire and learn from the more perfect structures of Europe, we must yet forbear a rigid imitation of them, as there are but few cases in which a different course would not lead to the bankruptcy of all concerned.

41. The method of engineers, generally, to combine these two causes of loss of water, and to introduce but one item into their calculations for both evaporation and filtration, will oblige us to use results of that kind, as well as distinct statements of filtration.

42. Huerne, in his History of Canals, (p. 266,) after detailed statements of the water consumed in different portions, while he admits the calculations to be but approximative, comes to the conclusion that during ten months of navigation the Languedoc canal loses by its filtrations alone (deduction being made for losses from evaporation) about eight times its prism of water, or eight-tenths of its prism per month. Now, if we were to reverse the rule of M. Gauthey, and deduce the evaporation from the

filtration, (and if the rule be correct it will admit of such an application,) the loss during the ten months, from the two causes combined, would be twelve of its prisms of water, or one and two-tenths prism per month, which would give an evaporation vastly exceeding that which engineers have used. And were we, on the contrary, to take the accredited rate of evaporation, and from that calculate the filtration, the result would be much below that which, from experience, actually takes place.

44. But the different parts of the canal observed, show great differences in the quantity lost by filtration, while there is no reason to believe there could have been much, if any, difference in the evaporation. The latter quantity, therefore, if used as a basis for calculation, would have led to great error. The rule, then, of taking twice the given evaporation to determine the filtrations, is, in our judgment, extremely unsafe. We will exemplify it farther.

44. The prism of one mile of the Languedoc canal is about 64,207 cubic yards. We have seen that it loses by its filtration eight-tenths of this per month, or an amount of 51,365 cubic yards. The surface of one mile is 48,644,893 inches. Now, the period of suspended navigation being in the winter, when the evaporations are very small, and may be supposed nothing, we will apply the whole of the mean annual evaporation of De Cotte to the ten months of navigation. This being 41·5 inches, would give for the ten months an amount of 43,269 cubic yards, or 4,326·9 cubic yards per month for the evaporation. The filtrations, being double this amount, would give 8,653·8 cubic yards. But we have seen that the amount, by actual observation, is equal to not less than 51,365 cubic yards. If, therefore, we were to rely on such a rule, it would lead us into shocking error.

45. Still less can we rely upon the rule of the engineer, Ducros, given by Mr. Sullivan in his report, (Ducros, however, quotes it as the opinion of the engineer Chausade,) of one and a half times the evaporation for the amount of filtrations. That these celebrated engineers, Gauthey and Ducros, may not have had facts on which to base their opinions, we do not pretend to dispute; but they must have been isolated facts, under some singular circumstances, and not adapted for a general rule. We can easily conceive that during periods of extremely dry and hot weather, with water very low in the canal, filtration would be much smaller than usual, and evaporation greater. The sides and bottom of the canal having been, from long use with a full volume of water, well compacted and the interstices closed, from the reduced pressure arising from a small volume of water, but little could pass by filtration, while all the causes of evaporation were acting with increased intensity.

46. But we have seen that this canal loses, during its ten months of navigation, eight of its prisms of water. (42.) We must suppose, also, that it contains a prism when its navigation is closed. Now this prism let into the canal during its period of navigation, must be lost also before the subsequent two months have passed; and these being months of little or no evaporation, it must be lost by filtration. The canal then actually consumes by its filtrations, for its ten months of navigation, nine of its prisms of water, or nine-tenths of a prism per month. The prism of this canal for one mile being 64.207 cubic yards, its loss, therefore, is 57,786·3 cubic yards per month, or 1,926·2 per day, or 80·21 per hour, or about 36·09 cubic feet per minute, from its filtrations, for every mile. The evaporations by the rule of M. de Cotte were found to be 4,326·9 cubic yards per month, (44;) which, treated in the same way, would yield 2·7

cubic feet per mile per minute. The total loss, therefore, on this canal, from evaporation and filtration combined, is 38·89 cubic feet per mile per minute. But if we take the evaporation of M. Pinn, of one-fifth of a prism in 20 days, (25,) the total loss from the two causes combined will be about 48 cubic feet per mile per minute.

47. We have gone into these details, because it was satisfactory to know what that canal, which, as is generally admitted, loses the least of any known canal, actually lost from the causes stated. But its loss being a minimum, rules derived from it would certainly be very unsafe guides to follow in judging of other cases, however valuable they may be in indicating the advantages to be obtained from a careful construction.

48. The board of United States engineers, in their report upon the Chesapeake and Ohio canal, (see Rep. p. 39, 40) assume as data for their estimate, the consumption of once its water prism per month, on account of losses from evaporation and filtration.

49. From experiments made on the Erie canal, and communicated to me by that distinguished engineer, Mr. J. B. Jervis, (to whom I am also indebted for other highly valuable communications,) it would appear that the least loss, from observations made at various places, was 100 cubic feet. This was not the measurement of loss from a distinct cause, but from all united—leakage of locks, evaporation and filtration The dimensions of this canal are, 40 feet water at surface, 28 at bottom, and 4 feet deep; which give for its prism of one mile, 26,595.5 cubic yards. The loss of 100 cubic feet per mile per minute is equal to 160,000 cubic yards per mile per month; or, supposing the navigation to continue for nine months, (in that climate,) the total loss would equal about 54 times its water prism per year; adding to this the loss of the prism in the canal at the closing of the navigation, gives a total loss of 55 of its prisms of water for all causes, except the demands of the locks for its trade.

50. This consumption of water is certainly very great. The commissioners, in their annual report of January, 1834, make the following remark:

"The Commissioners are inclined to the opinion, that, with proper care in guarding against the waste of water, 100 cubic feet per mile per minute for leakage, filtration and evaporation, (all causes of consumption) would be a safe estimate for the western and middle sections of the Erie canal; but it is to be believed it would be found, on a careful examination, that a much greater quantity would be necessary on many parts of the eastern section, where the soil is more open, the levels shorter, and the locks more frequent."

51. Shallow canals lose more than deep ones. This is a point now so well settled by experience, that facts need not be adduced to prove it. We mean, more in proportion to their dimensions; that is, in proportion to their filtrating surfaces. In our own country we have an example of a deep canal, (the Chesapeake and Ohio canal,) the depth of which is six feet.

52. Mr. Fisk, the chief Engineer of that canal, after repeated and careful observations over an extent of about 40 miles, represents its loss, on account of its evaporation and filtration, at 60 cubic feet per mile per minute. Its dimensions are 60 feet at the water surface, 32 feet at bottom, and 6 feet deep, which give, for one mile, a water prism of 53,673 cubic yards. And as this canal loses 60 cubic feet per mile per minute, from evaporation and filtration, it will amount to 66,000 cubic yards per month per mile, which is more than three-quarters of a prism.

53. Now, if we suppose the navigation of this canal to continue during ten months, and add to the loss just stated, that of the prism of water left in the canal, it will make 18½ prisms of water for its navigable year.

The observations of Mr. Fisk were made upon that part of the canal between Harper's Ferry and Seneca, which has been the longest in use. Much of it also passes through low ground, and may therefore be considered as the drain of the adjacent high grounds; and where exposed to the causes of active filtration, it was puddled with great care. On these accounts I conceive its loss may be fairly considered, under our system of construction, as a minimum; and that the safer rule for a general estimate, on account of losses from filtration and evaporation, would be two prisms per month. Its actual loss being, then, 1·85 prism, our safer rule adds 0·15 of the prism of one mile per month, which would increase the stated loss per mile per minute 2·25 cubic feet; or make the whole, exclusive of the prism left in the canal on the closing of the navigation, 62.25 cubic feet per mile per minute. This prism, left in the canal at the closing of navigation, is as has been shown, equal to 53,973 cubic yards, (52,) for one mile. As its loss is for the whole ten months, it would be 3,374 cubic feet per mile per minute, making the total loss per mile per minute equal to 65,624 cubic feet.

(To be Continued.)

Pisé Buildings.

Few details in regard to the mode of building in *Pisé* are to be found in any English work. There is no doubt that in those regions where the proper kind of earth is to be found that it presents great economical advantages. There are many, doubtless, in the Northern States, to whom the following remarks may prove useful.

From the Southern Agriculturist.

To the Distressed Inhabitants of the City of Charleston.

Seeing from the Act of the Legislature, as well as from the Ordinance of our City Council, that in future we are restricted to the use of incombustible materials in erecting our buildings, and knowing as I do the high price of such, and the difficulty of getting them at so high a price, I would suggest the use of *Pisé*, or rammed clay walls. This mode of building is of great antiquity, and brought to such perfection in the country about the beautiful city of Lyons, in France, as to appear like elegant palaces, some of which are known to have stood three hundred years. But to be concise on this subject: I have just erected the walls, and covered in a house of 48 feet long by 24 wide, containing six large rooms, and three wide passages; and though built under many difficulties which I had to surmount as I went on, yet it will bear comparison with any brick house of the same size, and was built in nine months by two men only, (who hired out at $10 per month before employed on this work) assisted by a black country carpenter for three weeks. From the experience I have gained in the erection of this house, I can with confidence recommend (if my directions are followed) the use of *Pisé buildings*; viz.—The foundation must be stone or brick, raised twelve to eighteen

inches above the ground. The mould, which is very simple, must be a piece of 3 by 4 scantling, laid across the foundation, with a mortice at each end, describing the width of your wall, allowing for the thickness of the boards that are to stand on their edges, with their sides to the studs of scantling, standing in the mortices of the transverse scantling already mentioned, and capped with a piece of the same width; these studs to be erected three or four feet apart. The flooring boards intended for the house, and which require seasoning, will just answer for this purpose, and will not be the least injured from this use, but better seasoned. They must be reduced to one thickness, and cut with a mitre at one end to meet at the corners, clasped with tin or sheet iron clasps, secured with small screws. These may be taken off every other course, and used as before. In this mould so formed, lay six inches of clay, as dry as you can procure it, (I never found it too dry) and commence ramming, with a rammer beveled from a square of six inches,to one inch all on one side. The Pisadore (who is the rammer) finding it will not yield more to this rammer, then commences with a square rammer, till it rebounds briskly from the wall; he then continues filling in, continuing the same process till the boards are full, and he lays another board on the edge of that just finished, and continues this process until the story is raised to receive the joists. These are laid on a piece of scantling 3 by 4, laid along in the mould, and each end is well dove-tailed. This being effected, I would recommend that the mould be taken apart from the wall; it will be found an equal continued surface, resembling a piece cut out of a rock, of the color of the clay. If this has any blemishes (or inequalities of surface) from the clay sticking to the mould, they can be immediately remedied by a plaster made of the same clay, with a mixture of cotton or hair. This being done, lay on the whole wall a coat of linseed oil. It will immediately sink in, and form an indurator, that will convert the surface to a crust of putty, impervious to rain or any kind of moisture. After you have given the wall a coat or two of the oil, you may paint it of any color you wish, which it will show and retain with the greatest brilliancy. Then erect your mould on the next story, and continue as before, laying, (which I forgot to mention) your door and window jambs plumb in their proper places in the mould, as you go along. This mould possesses many advantages over the one which I described in my former article in the Agriculturist. It turns out the work in one continued mass, as if chiseled from a rock, and by this the work is reduced to three-fourths of the labor, and much more planished and perpendicular. In this manner, a Pisé house can be built as elegant, durable, strong and incombustible, as of any other material allowed to be used. Its expense will depend much on the locality and vicinity of the clay, to the place it is erected. Having the clay at hand, my Pisadore (or rammer) and one attendant, carried up sixteen inches of a wall, sixteen inches thick, in four days, all round a house, 48 feet long, and 24 feet wide. Now, if to build such a wall sixteen inches high, requires four days, how many days will it take to build it thirty-six feet high, the full height of a three story house? Answer 108 days; which, at one dollar per day, would be equal to $216.

A brick house of this size would require 100,000 bricks, which at $15 per M., will amount to	$1500 00
Lime at 25 bushels per M., is 2500 bushels, at 20 cents, .	500 00
Laying the bricks at $4 per M., is	400 00

Cost of the walls of the dwelling house only, . . .	$2400 00
Deduct the price of building the Pisé house, . . .	216 00
In favor of the Pisé house, ...	$2184 00

But this is not all, for in a brick house you have to build a wood one within to make it fit to be inhabited, plaster and studs, laths, lime, nails and stucco, will amount to $1200, making the round sum of $3384. In opposition to this, I will state, the Pisé walls require no plaster, but only to be smoothed and painted plain, or penciled, as taste may dictate. The Pisé house being painted as it comes out of the mould, is fit to be inhabited as soon as finished.

But the difficulty of procuring clay is objected to. This will cease when we are informed, that all the bluffs about our harbor and rivers, contain it in abundance, and may be wafted over in lighters, and sold at a low price. Our harbor, and the rivers and creeks around us, contain inexhaustible banks of dead shells, which, if rammed in such a mould, will produce a fine wall equal to Tabby, well known to many of us. The banks of Ashley river abound in a concretion of calcareous matter fit for such buildings. To this important hint I call your attention. The doctrine that I have been endeavouring to inculcate, admits of the clearest demonstration, *actual experiment.* Take a box of a handy size, ram it with clay as described. When so filled and rammed, turn it up on a board, and lay it in the sun to dry, so as the box or mould may be lifted off without injury to the pisé'd work. When dry, indurate it with linseed oil, and when it is dry, paint it on either side with any color you please. This experiment will satisfy you of the strength of the walls, the effects of the oil as an indurator, and the beautiful appearance of the paint.

I remain, with best wishes, yours, &c.

BARTHOLOMEW CARROLL.

(Continued from page 62.)

Report upon the Finances and Internal Improvements in the State of New-York 1838.

The total amount borrowed to construct the canals, was 7,672,782, of which amount $3,326,295 has since been paid directly to the public creditors, and certificates of stock have been cancelled to that extent. The duty of receiving the money and holding it for the creditor, is by law entrusted to the Board of Commissioners of the canal fund; and this body stands between the State and its creditors, acting at the same time as agents of the State, and trustees for the creditors. The commissioners have discharged their duty so far as to receive from the State "full and complete payment" of the debt; and they are now engaged in executing the remainder of their trust, by paying the money to the creditors. They have repeatedly notified those creditors by public advertisments, both in this country and in Europe, and also by written circulars whenever their residence could be discovered, that they had received the money, and were prepared to pay it; but as the debt, according to the terms of the loan, does not fall due until 1845, the Commissioners, in order to avoid the responsibility incurred in keeping so large an amount permanently invested, have offered large premiums to the creditors to come forward

and receive payment and surrender their certificates. The Commissioners have thus reduced the amount to $2,346,487; so that little more than two-sevenths of the original sum now remains unpaid. As a considerable portion of this remnant of the debt is held by persons residing in foreign countries, it is not improbable that some of them may neglect or refuse to receive payment until the year 1845, and the money must consequently remain at least until that time invested for their benefit in the hands of the Commissioners. It will be perceived, that whatever force there may be in this constitutional objection, will not be diminished by the payment of any portion of the debt, however large; so that whether five-sevenths or ninety-nine-hundredths of the debt should be paid, the position would not be varied. The pledge can only be literally performed by paying the last remaining dollar to the last remaining creditor. No middle ground exists between this extreme consequence and the position that the pledge is satisfied for all fair and practical purposes, when the amount of the debt is paid over to the Commissioners and safely invested by them in trust for the creditors.

It is under these circumstances that the doctrine is advanced, not on the part of the holders of this remnant of the debt, (for it is believed that they are wholly indifferent as to the matter,) but by those who seek to arrest the progress of our public works, that the canal tolls shall not be reduced or diverted until the last dollar shall be literally paid to the creditor. That no matter however important it may become to our commerce and general interests to revise and regulate the rates of toll; that no matter how just or pressing may be the claims of other parts of the State for works of internal improvement; the canal tolls shall be held "beyond the reach of the Legislature;" at least until the year 1845, when interest ceasing on the debt, the creditor may probably be willing to receive payment:—and the doctrine involves this monstrous consequence, that the whole accumulating amount of the tolls, which with the compounding interest, would produce, by the year 1845, at least ten millions of dollars, must be kept invested in money as a further pledge for the payment of a sum of two millions, and which very two millions already exists in money invested on safe security: and that in the meantime the public improvements of the State must be deferred, and direct taxes imposed to defray the ordinary expenses of the government!

In the judgment of the committee no such absurdity was contemplated by the framers of the Constitution, or could ever be submitted to by the people. The clause in question evidently was intended merely as a guaranty, not so much to the public creditors as to the people of the State at large, that a sum should be raised from the tolls and other revenues pledged, sufficient to satisfy the debt, and provide against the hazard of taxation for that purpose. And this was all its object. It was never dreamed that ten millions should be accumulated in order to pay two millions. The restriction was adopted upon the mistaken calculation that the revenue would not more than pay the debt as fast as it became due. Time has disclosed that error. The money is raised and ready, and upon every sound and rational principle of construction the pledge is satisfied. The State has done all that the most scrupulous good faith could require, and no reason exists why the tolls which are thus redeemed and unfettered, should not be regulated or reduced in such manner as the Legislature shall think fit, or applied to any beneficial purpose which the public interests may require.

And in this light the question has been viewed by the representatives of

the people. By the act of May 11, 1835, the Legislature directed that the canal tolls should be expended in enlarging the Erie Canal to such dimensions as the Canal Board should determine, who were thereby also authorized to construct an "independent canal," in such parts of the route as they should think expedient. The canal, according to the plan since adopted by the Board, will be about three times as large in volume as the existing canal, and its location will be changed for several miles of the route. The Revised Statutes, in 1830, had explictly declared the Erie and Champlain canals to be completed: so that both legally and practically, the canal thus altered in dimensions and in location, may be considered as a new work. The tolls expended in its enlargement, to all technical intents are as much "diverted," as if employed in constructing a lateral canal, or any other of the public works of the State; and the consequences, so far as the public creditors or the people of the State at large are concerned, are in no respect different.

But the 9th section of the act placed the intention of the Legislature beyond all doubt: for it directed that the expenditures in thus enlarging the canal "should be so limited as to leave from the canal revenues an annual income to the State of at least $300,000." In other words, the Legislature appropriated that amount of the canal tolls to the ordinary uses of the government.

By a subsequent act, passed May 16, 1836, the Legislature increased this annual sum from $300,000 to $400,000: but possibly for the purpose of quieting constitutional scruples, the phraseology of that law directed the Commissioners of the Canal Fund to "loan" that sum annually "to the treasury of this State, for the use and benefit of the General Fund;" and the Comptróller was directed to charge the General Fund "as a debtor," for such loan to the Canal Fund. It is rather to be regretted that it should have been thought proper or necessary to throw the transaction into this form. If the State owned the tolls free from the encumbrance of the public creditor, no necessity existed for this legislative fiction. If it did not, the propriety of abstracting the tolls, under the guise of a loan to the General Fund, (which fund existed only in the canals themselves) may well be questioned: while the very fact of charging the State, or the General Fund, "as a debtor," for the amount of the tolls, was calculated needlessly to perplex the public mind in regard to the true state of the finances.

It is therefore quite evident, that the tolls of the canals have been brought fully within the reach of the Legislature: and the very important question then arises, in what mode shall they be appropriated so as most effectually to promote the progress of the public works?

By the acts of 1835 and 1836, the tolls, after deducting $400,000 annually, (and of which sum about one half is applied, in paying the interest on the debt for lateral canals,) have been appropriated to the enlargement of the Erie canal. The cost of that enterprise, originally estimated at $12,000,000, will not probably fall short of $15,000,000; so that if only the nett revenues (now amounting as it is above shown, to $787,183,) shall be applied to that purpose, the work cannot be completed short of twenty years: and during the whole of that time those other works must be deferred, which could be aided by this revenue in case a proper scheme of finance were to be adopted.

The policy and the plan of enlarging the canal, have been definitely settled by the constituted authorities, and after mature consideration. Ex-

penditures have already been incurred in prosecuting the work to an amount exceeding $600,000, and contracts have been made in addition to the extent of nearly three millions. The idea of abandoning the undertaking, even if it were desirable, is therefore quite out of the question. The committee are moreover satisfied, that the speedy enlargement of the canal is required by the best interests, not only of the inhabitants in its immediate vicinity, but of the people of every part of the State. The Canal Commissioners in their recent report to the Legislature, have estimated its annual tolls within a few years after it it shall be completed, at no less than three millions of dollars, equivalent to an annual income of five per cent. on a capital of sixty millions, and that of this large revenue at least one half will be paid upon property passing to and from other States. It is quite evident that such an income will enable the State, after making the most judicious revision of the rates of toll, to extend its fostering aid to every portion of its territory, however remote or sequestered. To secure such a result with the least practicable delay, is therefore, an object of general importance.

The canal, when enlarged, will be greatly increased in value and power, and in point of magnitude will be one of the most important works, not only of this country, but of the age. Its capacity exceeding that of the present canal, at least seven fold—being seven feet deep and seventy feet wide, with double locks of enlarged dimensions throughout the whole line,—it will furnish the means of convenient transit for not less than ten millions of tons annually. The supply of water will be abundant and unfailing, and the enlarged size of the boats by which it will be navigated, will reduce the cost of transportation nearly one half; so that if the tolls should even be retained at their present rates, the saving to the community in the aggregate expense of conveyance, would be from one-fourth to one-third of the amount now paid. It must be borne in mind however, that to effect this saving, the enlargement must be completed throughout the whole line, so as to avoid the expense and delay of trans-shipment,—and from this fact it will be obvious, that important financial consequences are involved in its speedy prosecution. By proper efforts, the enlargement may be completed and made available within five years. At the expiration of that period, the interest, at five per cent., compounded half yearly, on the work, (estimating it at fifteen millions) will amount to about two millions and a half of dollars; whereas, if the completion shall be delayed twenty years, the intervening interest alone will exceed nine millions; showing a loss of interest by proceeding at the present sluggish rate, of at least six and a half millions of dollars; a sum which of itself would go far to extend the benefits of internal improvement to every other section of the State.

In order thus to expedite the work, it will become necessary to borrow money and incur a temporary debt. That this suggestion will alarm those who regard a public debt as the greatest of all public calamities, is not improbable; and it may very possibly arouse opposition, as violent as that which was arrayed against our canals in their early stages. The hope is however indulged, that the successful example furnished by that great experiment will dispel any groundless fears, and impart to our public councils that degree of moral courage which the occasion requires.

Our fathers did not hesitate to encounter debt, even when the means of paying the interest were unascertained and contingent; and surely we may venture upon a similar effort, now that we are certain that the revenues of the State will suffice to pay the interest. The present nett annual revenue of the State, after paying its expenses and the interest on its debt, is $787,183, as above stated. That sum alone will pay the annual interest at five

per cent. on $15,743,660; and that amount may therefore be borrowed and expended, and the interest punctually met without taxation. Any augmentation which shall be experienced (either by means of the expenditure of that sum, or from any other cause) in the revenue of the canals, will itself increase to a corresponding extent the ability of the State further to borrow and pay the interest. It is evident that every $500,000 of revenue will serve as a basis of finance to sustain ten millions of debt. If the estimate of the Canal Commissioners is correct, (and from their well known caution their opinions in this respect are peculiarly entitled to confidence) that the enlarged Erie Canal will yield an annual revenue of three millions, equivalent to five per cent. on sixty millions, it will at once be obvious that a sum of thirty millions may not only be borrowed, and expended, but wholly reimbursed, within twenty years; or that forty millions may be so borrowed, expended, and reimbursed, in twenty-eight years.

Nor need it be apprehended, that in order to produce these immense results, the tolls of the canals must be maintained at oppressive or injurious rates. During the years 1833, 1834, and 1835, the rates were reduced in the aggregate about 35 per cent. and yet during these three years the tolls amounted to $4,209,000; whereas in the three years next preceding the reduction they had amounted to only $3,185,000, exhibiting an increase of upwards of a million of dollars. The responsible duty of regulating the tolls to be imposed upon the great and almost illimitable trade which our canals are to enjoy, and of fixing the rates so judiciously as best to promote our commercial and agricultural prosperity, and at the same time adequately to strengthen our fiscal resources, will undoubtedly be exercised with that prudence, liberality, and forecast, which the magnitude of the subject demands. Whatever rates of revenue may be eventually adopted, we may safely assume that the State will take care to reserve such an amount in the aggregate as the interests of its treasury and the general welfare of its citizens shall require.

The committee, therefore, have no hesitation in recommending that the State proceed promptly to borrow such moneys as are needed to prosecute most vigorously its public works, and in lieu of appropriating the revenue only of the present canals for the purpose of making such expenditures as the general interests require, they would suggest that the State should retain that revenue as a sinking fund to pay the interest on all moneys it may borrow, from time to time, to prosecute and perfect a liberal system of internal improvement.

It is not the appropriate duty of the present committee to point out those particular works which stand most in need of the efforts or the fostering care of the State. That gratifying office will devolve upon those by whom it will doubtless be faithfully and wisely discharged. The view which they have sought to take, is purely fiscal in its nature: aiming only to demonstrate the pecuniary ability of the State to proceed promptly and liberally in the great work of improving its internal condition and developing its resources. They confidently believe that the success hitherto attained in the prosecution of our system of internal improvement is but the precursor of triumphs far more important; that the results we now enjoy but faintly shadow forth the vast realities which are within our reach; and that it needs but to employ promptly and vigorously our resources to augment yet more fully and gloriously the power and prosperity of the State. Without trespassing upon the province of those whose duty it is to prescribe the particular details of those great measures of policy, by

which our dormant energies may thus be roused into salutary and profitable action, the committee would observe generally, that the works which for the next few years will occupy the attention of our public authorities, are,

1. The rail-roads connecting the distant extremities of the State, and the interior portions with each other.

2. The Erie canal with its various tributaries.

On the subject of the policy to be pursued by the State in regard to the construction of rail-roads, differences of opinion exist.

On the one hand it is contended that these great avenues of travel and communication which affect so intimately the convenience and welfare of all our people, should be constructed and managed exclusively by public agents acting under public authority: and the success of those governments which have pursued that policy, not only in cheapening the cost of transport, but in avoiding the mischiefs of monopoly has been adduced as a reason why the State should possess, and at all times regulate, this important branch of our internal improvements.

On the other hand it has been urged, that the employment of the great number of persons required to conduct the manifold details of these crowded channels of transportation, would throw into the hands of the State, an undue amount of power and patronage: and it it alleged that this danger will be avoided, and the public convenience in other respects promoted, by entrusting their management to companies of individuals duly incorporated. It is also contended, and especially by those who are habitually skeptical as to the success of our public works, that the value of rail-roads has not yet been sufficiently tested, and that they will eventually fail to yield results sufficiently profitable to render it desirable for the State to construct them at the public expense.

The State has declined, hitherto, to construct rail-roads on its own account, but has preferred to commit that duty to incorporated companies; and has afforded aid, at least, in one important instance, by a loan of the public credit, taking as security a mortgage of the work. If a similar course shall be pursued in respect to all the rail-roads which may stand in need of public assistance, and the interest on the stock to be thus loaned shall be regularly met by the companies, the treasury will remain wholly unaffected by such measures of aid, and in a fiscal point of view, the State will experience neither profit nor loss.

The legislature has taken care, however, in the charters by which the rail-road companies have been incorporated, to reserve the right ultimately to take those works for public use, and the State may possibly exercise this right at some future period. The total cost of the leading lines will not fall short of eighteen or twenty millions of dollars; but the State will find no difficulty, whenever it may see fit to take these works, in making such financial arrangements as the occasion may demand.

The sum which the treasury will require for the canals now in progress, will be:

1. For enlarging the Erie canal, including damages,	$15,000,000
2. For the Genessee Valley and the Black River canals, (authorized to be constructed by laws passed in 1836,) in addition to the amount of $190,920 22, hereinbefore included as part of the State debt, not less than	5,000,000
	$20,000,000

For the two last mentioned canals, loans have been already negotiated to the amount of $2,800,000, but the proceeds, (with the exception of the $190,920, have not yet been expended.

In addition to the amount above stated, it may be observed that sundry projects for other canals of smaller extent, have been more or less entertained, including among others, an extension recommended in the Governor's message in 1836, of the Erie canal from Buffalo westward to a point on Lake Erie less obstructed by ice: the extension of the Black River canal into the mineral districts of St. Lawrence county: the continuation of the Erie canal, or the construction of a branch from it to some proper point below the Overslaugh: and some other extensions of existing works. If any considerable portion of these projects should be carried into execu. tion, the cost will not probably fall short of $5,000,000.

The connexion which it is proposed to affect by means of a ship canal between Lake Erie and Lake Ontario, has been excluded from the above estimate, under the belief, that a work so interesting and important in a military point of view, will be constructed at the expense and under the authority of the general government.

It thus appears:

1. That the amount which the State must expend under existing laws, for the enlargement and construction of canals already commenced, will be $20,000,000
2. That the amount to be paid from time to time, for taking rail-roads for public use, whenever the State shall find it beneficial to the public interest to do so, may be from ten to twenty millions, according to the extent of the works to be selected: or say $15,000,000
3. That the amount to be hereafter authorized for extensions of the present canals, may be $5,000,000

Making a total of $40,000,000

It is not, however, to be inferred that the committee intend by stating the above sums to recommend an expenditure to the amount of forty millions upon our public works. It is certain that under existing laws, at least one half of that sum must be so expended; but whether any portion of the residue will be appropriated, will of course depend upon the views of the present and succeeding Legislatures. They wish merely to be understood, that if the Legislature from time to time shall see fit to expend that sum, it may be safely borrowed, without imposing any burthens upon the people; and that if the views of the Canal Commissioners, as to the future revenues of the canal, are correct, the whole amount, within thirty years, may be reimbursed, and added to the productive property of the State. It is not improbable that those who are in the habit of decrying our public works, may assert that a debt is to be incurred to an alarming amount, to be handed down as a grievous burthen to all future generations; and yet, in truth, we shall only hand down what our fathers have tranmitted to us, public works, paid for and free from debt, and themselves affording the means of still further augmenting the power and wealth of those who are to follow us.

Nor will this event be deemed at all improbable, when we reflect that within the last twenty years the canals have come down to us free from debt, and worth more than twenty millions. Actual experience has thus familiarized us with the certain operation of an excess of revenue in extinguishing a debt created for public works,—but for the sake of presenting

the subject in a more perspicuous form, an arithmetical table is subjoined, —exhibiting the progress of a debt within the next ten years, to the extent of forty millions; and then the successive stages by which it will reach its final extinguishment.

In respect to that part of the annual report of the Comptroller of this State on the finances referred to the consideration of the committee, which suggests the expediency of levying a tax for the purposes of the treasury, they are compelled to state that, in their judgement, no necessity exists for that measure. They are aware that, from the year 1827, when the report of Mr. Wright announced to the public that internal improvements could only be sustained by direct taxation, down to the present time, our fiscal officers have habitually urged upon the Legislature the necessity of resorting to that method of levying money for the use of the State. It is not without diffidence, that the committee feel themselves compelled wholly to dissent from the experienced individuals who, for the last ten years, have controlled our public affairs; but, after a laborious and careful investigation, they have been unable to discover any reason why such a mode of raising money should have been recommended. In the opinion of the committee there is no possible ground upon which a tax could be justified. The treasury is full and needs no replenishing: and ample means are provided for meeting the future engagements of the State. Under such circumstances, to subject the people to the burthen of a direct tax, would be equally unwise and unecessary.

It is stated, however, by the Comptroller, and the fact has been repeatedly urged in other official communications, that Mr. Jefferson lays down the rule that a government disposed to cherish its credit "should never borrow a dollar without laying a tax in the same instant for paying the interest annually, and the principal in a given time." But the maxim is not sound, to the extent to which it is thus attempted to be applied. It will be recollected that Mr. Jefferson lived in a period of war and wasteful expenditure; and in speaking of the consequences of public debt, he doubtless intended to refer to expenditures upon objects not of themselves yielding a pecuniary return—such as the public defence, the protection of commerce, or the expenses of the civil administration. No reason can possibly exist for extending the rule to debts incurred for public works, themselves pro lucing an income equivalent to the interest; nor is it absolutely requisite that such revenue shall be received "in the same instant" in which the debt is created, provided that it will be realized within a reasonably moderate period. It may, indeed, be admitted, that when such result is problematical, or only to be realized at a remote period, the tax ought to be laid when the work is commenced; provided always that the government possesses no other pecuniary means of paying the interest. But then it must be shown that no such auxiliary resources are possessed, for otherwise there could be no necessity for levying money by tax for the mere purpose of preserving pecuniary funds which could be more directly and economically applied to the object in question. And this is the view which the Legislature has taken of this question, from the year 1826, when the State tax was discontinued, down to the present moment. Although annually urged to levy a tax, they have annually refused: but have seen fit to rely on the revenues from the public works, to meet the demands on the treasury. The result has shown that they were right; for although the State since 1825, has expended in constructing lateral canals the sum of $3,364,304, it has still remaining an annual surplus revenue of nearly $800,000; and its people are free from taxation.

Without pretending, therefore, to detract from the general authority of the maxim thus quoted, it may be claimed that our own experience has shown it to be inaccurate, when applied to debts created for works of internal improvement. In truth, it is hardly credible that Mr. Jefferson ever intended thus to apply it; but if he did, it only shows, what his incredulity in respect to the Erie canal had sufficiently testified, that enterprises of that character had not occupied his most deliberate attention.

It will be perceived that the very foundation upon which the financial calculations of the committee are based, is the estimate of the Canal Commissioners submitted to the Legislature, in which they state tnat the Erie canal, within a few years after its enlargement, will produce an annual revenue of $3,000,000. The importance of verifying the accuracy of this estimate will be evident, as any material error would lead to the most injurious consequences. The inquiry has necessarily embraced details of unusual magnitude, but having subjected them to a careful scrutiny, the committee state succinctly, the reasons why, in their opinion, that estimate is entitled to reliance.

The steady progress of population and wealth of that portion of our own State which is tributary to the canal, needs little remark. Whether owing to the growth of the country on its immediate borders—or to the influence of the lateral canals, in swelling its commerce,—the tables of tonnage exhibit a rate of increase which will probably be maintained for many years. Although the contribution thus furnished by the State to the revenues of the canal, at the present time is large, (for two-thirds of the whole of its tolls are now drawn from the trade of our own people,) yet the amount becomes relatively unimportant, when compared with the enormous results we are hereafter to derive from our commerce with the west. Let us then advert briefly to the present extent and future progress of that commerce, and the probable effect which it is hereafter to produce upon our fiscal affairs.

The western termination of the Erie canal looks out upon Lake Erie, the most southerly and central of the great chain of navigable lakes, which stretches far into the interior from our western boundary. Around these inland seas, a cluster of five powerful States is rapidly rising. The territory which they comprise, and which is to become tributary to the canal, embraces that great area, extending from the lakes on the north to the Ohio on the south, and from the western confines of this State to the upper Mississippi, and containing 280,000 square miles. To measure its extent by well known objects, it is fifteen times as large as that part of the State of New-York west of the county of Oneida—nearly twice as large as the kingdom of France—and about six times as extensive as the whole of England. It contains 180 millions of acres of arable land, a large portion of which is of surpassing fertility.

The productive property of this region, and its capability of supplying tonnage for export, are greatly strengthened by the facilities which it enjoys for cheap and easy transportation. In this respect, no country on the face of the globe enjoys greater natural advantages: for it is nearly encircled by navigable waters; and its broad area is intersected in numerous directions by streams furnishing ample means of conveyance, while unusnal facilities for the construction of canals, and other artificial channels of communication, are afforded by the level and uniform character of its surface.

These being its geographical advantages, it needs only the requisite number of inhabitants, to fully develope its agricultural resources. Its progress in this respect has been truly surprising. In 1816, Ohio was the only organized State government within its limits. In that year, Indiana,

having obtained the requisite number of 60,000 inhabitants, entered the Union, and took its place by the side of Ohio. Illinois and Michigan were then distant and feeble territories, with a few settlers thinly scattered over their broad surface; while Wisconsin, unknown even by name, was an undistinguished portion of the great North-Western territory. In the brief period of twenty-one years, such has been the influx of population into this great district, that Ohio, the eldest member in this brotherhood of nations, now numbers 1,400,000 inhabitants; Indiana upwards of 600,000; Illinois and Michigan, (both of whom have organized their governments and come into the Union,) 700,000; while west of lake Michigan, not only is Wisconsin rapidly rising, but even beyond the upper Mississippi, 30,000 citizens have already laid the foundation of yet another State. Such is the onward march of this population, that the amount of its annual increase alone exceeds in number the white inhabitants of ten of the States of the Union. The population already embraced within the district in question, falls little short of three millions, and if the same rate of progress shall be maintained for the twelve years next to come, by the year 1850 it will exceed six millions.

The peculiar activity and energy of these people, and their power most rapidly to develope the resources of the broad domain which they inhabit, are also worthy of consideration, in estimating the eventual extent of their trade. They probably possess a greater aggregate power of production than any other portion equally numerous of the human race. Their population is made up almost exclusively of the young, the resolute, the vigourous, and the intelligent, who have gone from the more crowded communities in the eastern and middle portions of the Union, to seat themselves around this chain of waters, and there build up an empire. They have taken with them the laws, the habits, the language, and the institutions, civil and religious, of their parent States, but above all, they have carried into that vast field, an honest love of labour, and in the very act of organizing their governments, they testified their willingness to exert and rely on their own energies, by prohibiting slavery forever, throughout all their limits.

This group of inland States has two outlets for its trade to the ocean; one by the Mississippi to the Gulf of Mexico; the other through Lake Erie and the navigable communications of this State to the Atlantic. Whether it be attributable to similarity of origin, of laws, or of habits, or to ties of consanguinity, or superior salubrity of climate, this people evidently prefer the market on the Atlantic, and they are making prodigious efforts to reach it. Three great canals, (one of them longer than the Erie Canal,) embracing in their aggregate length, about one thousand miles, are to connect the Ohio with Lake Erie, while another deep and capacious channel, excavated for nearly thirty miles through solid rock, unites Lake Michigan with the navigable waters of the Illinois. In addition to these broad avenues of trade, they are also constructing lines of rail-roads, not less than 1,500 miles in extent, in order to reach with more ease and speed, the lakes, through which they seek a conveyance to the sea-board. The undaunted resolution of this energetic race of men is strikingly evinced by the fact, that the cost of the work which they have thus undertaken, (and most of which are in actual progress) will exceed forty-eight millions of dollars—a sum far exceeding all that New-York, with two millions of inhabitants, and two hundred years of accumulated wealth, has ever attempted. The circumstance, moreover, is particularly important, that the public works in each of these wide-spread states are arranged on a harmonious plan, each

having a main line supported and enriched by lateral and tributary branches, thereby bringing the industry of their whole people into prompt and profitable action, while the systems themselves are again united on a grander scale, in a series of systems, comprising an aggregate length of more than 2,500 miles, with lake Erie as its common centre.

The various portions of this vast work are now in a train of rapid construction. Indiana alone has 6,000 men in her employ; and Ohio, Illinois, and Michigan are making correspondent efforts; so that it may be confidently predicted that within seven years from this time, the whole inland trade of that broad region around the lakes, will crowd the entrance of the Erie canal on its way to the Atlantic.

It will at once be obvious, that the whole of the tonnage thus to be furnished by these communities, whatever may be its bulk, will pay to our treasury a transit duty for the whole length of the canal; and will therefore yield a revenue twice as large as an equal quantity of products from the districts of our own State, mid way between the Lakes and the Hudson.

And what will be the amount of this tonnage, and by what standard shall we measure it?

If we take the area and the products, and the population of our own State as a guide, we fall far short; and even if we resort to more populous nations —if we select England or France, and compare their productive power with that of this youthful and rapidly increasing race, the parallel will not be complete; for a much smaller proportion of the inhabitants of those kingdoms is devoted to agricultural pursuits; nor is their inland commerce wholly concentrated within any single channel.

But we, fortunately, possess an adequate nnd appropriate standard in the Mississippi river, the great rival and competitor of the Erie canal, with which it is destined hereafter to hold divided sway over the vast trade of the west. The number of inhabitants who at present employ that stream and its tributaries, for the purpose of conveyance, is scarcely five millions, and yet the amount which they paid the last year for transportation on its waters, was between eight and nine millions of dollars.

The momentous question, whether the tonnage of the inland district under examination is to seek the Atlantic through the Erie Canal, or descend the Mississsippi to the Gulf of Mexico, is mainly to depend upon the comparative cost of transportation. But when we consider the circuitous course of the Mississippi, the loss of time in ascending its strong current, and the greater rapidity of communication presented by the Atlantic route; when we advert moreover to the ample volume and trifling lockage of the enlarged canal; and especially when we estimate the commercial effects of the navigable passage opened by the Hudson through the Alleghany ridge; we shall perceive that when the artificial communications thus concentrating upon Lake Erie shall be put in full operation, the cost of transporting agricultural products from the interior of this district will not materially vary, whether carried to the Atlantic or the Gulf of Mexico. The inference then, may safely be drawn, that whenever a population of five millions around these western waters shall resort to the Erie canal for the means of conveyance, they will supply it with an amount of tonnage equally great with that now transported on the Mississippi by an equal number of inhabitants.

It is estimated that the value of agricultural products which annually descend the Mississippi and its tributaries, has already reached $70,000,000. The value of the property transported on the canals of the State of New-

York, during the year 1836, is shown by official tables to be $67,000,000. Of that amount, it may be estimated that $50,000,000 consisted of property belonging exclusively to a portion of the population of this State not exceeding a million and a half in number, being at the rate of $33 33 for each inhabitant; and that the amount which they paid for its transportation, exceeded two millions of dollars. If the same scale of production and consumption shall be assumed for the population of the district in question, (and no reason is perceived why it should not be,) the six millions of inhabitants in the west who will resort to the Erie canal for the means of conveyance, will furnish tonnage, in exports and imports, of at least $200,000,000 in value. The experience of other nations will show that this amount is not over-estimated. The food alone produced in England in the year 1835, by an agricultural population of about eight millions, was valued by their political economists at $604,000,000; while that of France was ascertained by its Minister of Finance to be 5,237,000,000 of francs, or $980,000,000.

But there are peculiar reasons why the proportion of agricultural exports of this great inland population should far exceed that of other nations. The exuberance of their soil, the salubrity of their climate, and the cheapness of their lands, (arising from the vast supply within their limits) will enable them always to furnish food to every other portion of the continent, on more advantageous terms than it can be elsewhere produced. Labour there reaps its best reward, and harvests of an hundred fold repay its exertions; and such is the superior productiveness of this region, that when the completion of its great series of public works shall bring a bushel of wheat on the plains of Indiana within a few cents in price of a bushel in New-England, its production in New-England must cease. The same cause will probably operate to change the culture of portions even of our own State; for the unequalled fertility of the West will always enable it to supply those products requiring richness of soil with a less amount of labour and consequently at a cheaper rate, than they can be produced within our own borders.

The consequences then of perfecting these systems of intercommunication will inevitably be a distribution of labour, on a grand scale, throughout the whole northern part of the continent: the maritime portions engrossing the active pursuits of navigation, commerce, and manufactures, while this central group of agricultural States will become the common granary of the Union, and discharge the important duty of supplying subsistence to all the surrounding communities. Indeed they have begun even now to perform that office. The vallies of the Miami, the Wabash, and the Illnois, are already pouring out their overflowing riches upon the cotton planting States below; and, although their power of exportation has hitherto been kept in check by their rapid increase in numbers, yet it is stated, that during the last season, exports amounting in value to 15 or 20,000,000 of dollars descended the Mississippi and its tributaries, from that part of the valley north of the Ohio, and constituting a portion of the great district in question. Nor is this descending stream of trade wholly withdrawn from our own channels of conveyance, for its proceeds find their way by a circuitous course through the canals of New-York, and in that form swell the revenues of the treasury:—and the fact will stikingly illustrate the value of the Union, in binding in bonds of mutual benefit all our commercial interests, both foreign and domestic, and in animating every portion of our various industry, that the food thus exported from the inmost recesses of the West—exchanged for cotton at the mouth of the Mississip-

pal—exported in that form to the workshops of Europe—again exchanged for their fabrics, and brought home by our shipping to the seaports of the north—is at last returned through the Erie canal to the luxuriant vallies from which it first originated; thus revolving through the whole circle of our wide-spread commerce. It is only when we view the Erie canal as one of the mighty segments of that vast circle, that we can rightly estimate the importance and grandeur of its connexions.

It is necessary also to be apprized of the course of this trade, in order to explain the disparity in value which will always exist between the descending and ascending cargoes. The amount of merchandise now sent into the Western States very far exceeds that of their products reaching the Atlantic sea-board. An additional reason exists, it is true, for this difference. The flood of emigration which has poured into that portion of the country has temporarily produced so great a disproportion between its consuming and producing classes, that they have scarcely been able to obtain an adequate supply of food even from their own exuberant soil. Population has outstripped production: so that their agricultural products, instead of seeking a market in the eastern portions of the Union, have been sent westward in large quantities into the upper lakes; and such is the movement which animates all that region, that more than four hundred vessels, during the last year, reached the port of Chicago, at the southernmost extremity of Lake Michigan. So long as this great influx of population shall continue, the capacity of these interior States to supply tonnage for the Erie canal will be necessarily diminished, but the effect will be only to augment more enormously their eventual power of exportation; and thus the present temporary check is but adding increased energy to those causes, which are operating with concentrated force to swell our future commerce.

The progress in population of that portion of this inland territory, immediately adjacant to the lakes, has been three times as great as its progress in the portion adjacent to the Ohio. The ratio of increase in the former, between the years 1820 and 1830, (as shown by the census) was 130 per cent., and in the latter, only 44 per cent.; and the comparative rates since that time have not, probably, lessened. And this circumstance explains why so large a surplus should have been furnished for exportation from the section near the Ohio, in comparison with that which has hitherto found its way from the lakes into our canals. The total amount of tolls, realized by our treasury in the year 1836, from property passing to and from the country surrounding the lakes, was only $385,000, or less than one-twentieth part of the sum paid annually for transportation on the Mississippi, and its confluents. To fix the precise period when the population, now swarming into this district, will reach the point when their power of furnishing products for exportation will fully exhibit itself, is, of course, impracticable. The same causes which operate to diminish their exports, now that their population has reached to three millions, may not be wholly removed, when its numbers shall be doubled, but it may be confidently predicted, that before that time they will be so firmly seated on their productive soil, as to be able to supply a vast surplus of food for export.

The population of the western portion of our own State still continues to increase with considerable rapidity, but it nevertheless furnishes an annual export of at least $20,000,000 in value. By the year 1845, the States of the West, surrounding the lakes, will hold the same relative position in respect to the whole of the Erie canal, which the counties of New-York,

west of the Seneca lake, now bear to that part of the line east of Utica. Our trade will then be measured, not by counties, but by sovereign States, themselves containing their fifty counties; and our revenues, no longer dependant on the villages and townships scattered along the borders of the canal, will be drawn from the wide-spread and populous communities, inhabiting the broad expanse between the Ohio and the Lakes.

We obtain, then, the following facts, by which to guide the present inquiry:—

That the value of the tonnage, annually transported on the canals of this State, being $67,634.000, and the tolls paid being $1,614,000, the rate of toll is about $2\frac{1}{10}$ per cent on the value of the tonnage:—

That this rate increasing according to the distance from tide water, of the place from and to which the tonnage is transported, the rate paid on the western section of the Erie Canal, is probably as high as four, or even five per cent.:—(The present toll of 32 cents on a barrel of flour worth $8, passing the whole length of the canal, is 4 per cent., or 5 per cent., if valued at $6:—)

That the rate of toll, on commodities passing to and from the States west of Buffalo, may therefore be safely assumed to be equal to at least *two* per cent. on their value; and it is believed, that the interests of the State will not require a reduction of the tolls below that rate:—

That a population, within this State, of one million and a half of inhabitants, furnished a tonnage of $50,000,000 to the canals,—and that, therefore, the population of the States in question, when it shall amount to six millions, can furnish a tonnage of $200,000,000. It may, however, be allowed, that a considerable portion, and perhaps two-fifths of their exports, will continue to descend the Mississippi and its tributaries, and that one fifth of their imports may ascend that stream.

We shall then have these results:

Descending cargoes, after deducting two-fifths, . . .	$60,000,000
Ascending cargoes, after deducting one-fifth, ...	$80,000,000
Total trade, ...	$140,000,000

At a meeting of the citizens of Cooperstown and its vicinity held at the house of Isaac Lewis on the evening of the 30th of January, instant, James Stowel was appointed Chairman, and Geo. A. Starkweather, Secretary. The meeting being thus organized, Ephraim Beach, Esq., the Engineer, who had been previously employed for the purpose of making a survey of the route from Cooperstown to intersect the Catskill and Canajoharie Rail-road, presented the following Report, which being read, on motion of James Stowel, Lawrence McNamee, Henry Phinney, Robert Davis, and Harry Clark were appointed a committee for the purpose of procuring the publication of said Report, and calling future meetings relative to the contemplated improvement.

JAMES STOWEL, Chairman.

Geo. A. Starkweather, Secretaty.

Catskill, January 15, 1839.

To Messrs. Stowel, Phinney, Jarvis, Roff, and others, of Cooperstown.

Gentlemen—In compliance with your wishes I have partially examined the ground, and caused a survey to be made of the route for a Rail-road from Cooperstown to intersect the Canojoharie and Catskill Rail-road, at, or near the Village of Canajoharie.

Commencing at Cooperstown, the route follows the eastern shore of Otsego lake six miles and a half, to where it leaves it, opposite the mansion of the late Geo. Clark, Esq. For this distance the expense of grading a road for either a single or double track will be light. A perfect level can be maintained the entire distance, although by some slight elevations the expense would probably be lessened. Easy curves are necessary to conform to the shore of the lake, but none will be required of a less radius than can be traversed by a locomotive with a speed of twenty miles an hour. The excavation consists almost entirely of earth and loose rock of an argillaceous nature. The embankments are light and of short distances.

Our course from where we left the lake pursues a northerly direction, following the Springfield creek, and crossing the Great Western Turnpike at or near the toll-gate in the town of Springfield. Thence pursuing the same direction until we come to the summit at the top of Springfield hill, a distance of thirteen miles from our starting point.

From the lake to the summit there is a gradual ascent of about thirty feet to the mile. The expense of grading this section will not materially differ from that of the other. The curves, if any are necessary, will be light. Indeed the nature of the ground from Cooperstown to the summit is extremely favorable for the construction of a Rail-road. With no curves of a less radius than eight hundred feet, and the excavations and embankments all of a light nature, it will at once be perceived that this part of the road can be constructed at a comparatively small expense.

Our course from the summit, was in a south-easterly direction, keeping upon the high ridge at a distance of about half a mile from Salt Springville. In descending from the summit to the valley of the Bowman's creek, I adopted a grade of eighty feet to the mile, although I am convinced from subsequent observation, that the descent can be accomplished with a grade of seventy, and probably sixty feet per mile, with a trifling additional expense.

Commencing then at the summit with a grade of eighty feet per mile, and crossing the Cherry Valley road a short distance below the Sulphur Spring, we continued our descent on the side-hill; and after crossing numerous ravines, reached the valley of the Bowman's creek at a distance of nine miles from the summit, and three miles from Ames'.

This will be the most expensive section of your road, and the only portion of it in which any difficulty will be encountered. A number of excavations and embankments, as well as curves will be necessary, attributable to the irregular surface of the ground.

There are circumstances, however, that will tend to diminish the expense on this part of the road. The land from its sequestered position and rugged nature will probably be given to the company, and at all events, can cost but a trifle. The timber for the principal part of the superstructure, can be found on the line of the road, and thus not only save the expense of transportation, but have it ready at all times, and at the necessary points, where its use will be required.

From the point where our line strikes the valley of the Bowman's creek, we proceed in a south-easterly direction, passing at a short distance from and south of the "Bowman's creek Meeting-house," and following the course of the creek, left Ames' four chains to the south. Thence pursuing the same direction, after crossing two inconsiderable ridges, we intersected the line of the Canajoharie and Catskill Rail-road at Flat creek, a distance of sixteen miles from the summit.

From the point where the line strikes the Bowman's creek flats, to the termination, the route is feasible, and for the greater part, can be easily constructed. For the last mile or two the descent is considerable, but not so much as to render the route in any degree unfavorable.

As the survey was an experimental one, and made with a view of ascertaining the fact, whether a feasible route could be found for a Rail-road between Cooperstown and the line of the Canajoharie and Catskill road, the most favorable route was not particularly sought for, and therefore but one was explored. Our object being accomplished by finding a practicable route, it must be left for subsequent, and more accurate surveys to determine upon the location of the road. For the same reason the actual cost of the road may, and probably will, fall short of the subjoined estimate. It is based upon the hasty survey of a route, which it is not probable will eventually be the line of the road, and which, for this reason, cannot claim to be accurate in its details. For the sake of convenience, I have divided the road into four sections, in the estimate of its cost.

The first section extending from Cooperstown along the lake shore six and a half miles. For grading, say about $5,000 per mile, ...		$32,500 00
Section second extending from the lake six miles and a half, to Springfield summit,		
For 65,000 cubic yards earth excavation, at 15 c	$9,759 00	
2,000 cubic yards rock excavation at $1	2,000 00	
73,122 cub. yds. embankment, at 20 c	14,624 40	
1,000 cubic yds. masonry, at $3	3,000 00	
Grubbing and clearing,	650 00	
		39,024 00
For the third section extending from the summit to Bowman's creek flats, nine miles,		
For 132,534 cubic yards excavation at 13 c	17,229 42	
144,846 cubic yards embankment at 15 c	21,726 00	
1,050 cubic yards masonry in bridges at $3	3,150 00	
843 cubic yards masonry in culverts at $2	1,686 00	
Grubbing and clearing,	4,000 00	
		47,791 42
For the fourth section extending from the Bowman's creek flats to the Canajoharie and Catskill line, seven miles,		
For 57,830 cubic yards excavation at 15 c	8,674 50	
35,032 cubic yards embankment, at 15 c	5,254 80	
1,500 cubic yards masonry, at $3	4,500 00	
Grubbing and clearing	1,500 00	
		19,929 30
Total amount for grading, ...		130,215 12
For 29 miles superstructure at $4,500 . .		130,500 00
Total for grading and superstructure . . .		260,745 12
Add for contingencies 10 per cent. . . .		26,074 51
Add for Engineering 5 per cent.		14,340 98
Total cost of road		$361,160 61

The above estimate is based upon the calculation for a graded surface of fifteen feet in width, with a foot to a foot and a half slope. The su-

perstructure to be laid in the same manner as that of the Utica and Schenectada road.

Permit me, gentlemen, to offer a few remarks on the advantages of a Railroad from Cooperstown to the line of the Canajoharie and Catskill road. Within the past few years, and indeed since the permanent utility of Railroads has been demonstrated, enterprise in this species of improvement has far excelled that in any other. Since the first successful experiment in this country, applications have been made and charters granted for Railroads to an unlimited extent.

The State of New-York has taken her stand among the first as an advocate for this kind of improvement, and the roads completed, together with those in progress of construction, conclusively show that her citizens fully appreciate the value of, and are determined to reap the advantages to be derived from their successful introduction as auxiliaries to commerce, manufactures, and agriculture. That a Railroad from Cooperstown to Canajoharie would not only be of the greatest importance to the section of country to be accommodated, but would also amply remunerate those who should invest their capital in the enterprise, there is in my mind no doubt.

Cooperstown, the county seat of Otsego, is one of the largest and most respectable villages in the State. Situated upon the head waters of the Susquehannah, and surrounded by a populous and fertile district of country, it will be eminently qualified to become the market and outlet for the produce of the upper valley of the Susquehannah, comprising the county of Otsego and parts of Chenango, Delaware and Madison. The increase of trade which would naturally accrue to Cooperstown from the completion of the Railroad, would render it one of the first inland commercial towns in the State. The only barrier then to its increase of prosperity and rapid growth, is the want of an easy communication with the Erie canal or Hudson river.

To overcome this difficulty, your proposed railroad is well calculated. It will open a channel of communication with both the above-mentioned thoroughfares, and will not only greatly diminish the expense of transportation, but produce and goods can be sent to, and received from, New-York in less than one-fourth of the time that is now required.

A few individuals residing on the line of the proposed Railroad, have expressed an opinion that a hard or McAdam road would be preferable. The idea I think an erroneous one for the following reasons.

A road of this description, constructed in a workmanlike and substantial manner, would cost nearly or quite as much as a Railroad, without securing any of the peculiar advantages of the latter. Again, from the expense of its construction, the tolls would necessarily be taxed at a high rate, and thus prevent the road from being much travelled on, except at those seasons of the year when other roads are impassable, or in a very bad condition. Neither would the Stockholders receive any pecuniary benefit; the tolls collected would be barely sufficient to keep the road in suitable repair. From the above reasons I believe the project of a McAdam road to be entirely impracticable, and I believe this also to be the opinion of a large majority of those immediately interested.

That the stock of the Railroad will yield a fair per centage on the investment will not be questioned. The immense amount of transportation, now carried on by teams, together with that which will be diverted from other channels, would, of itself, warrant the construction of the road. The profits to be derived also from other sources will leave but little risk for those who shall invest their capital in this enterprise.

In conclusion, I would say, that public convenience, as well as private interest, demands the speedy construction of this road, and as an old citizen of Otsego, and one who feels a lively interest in the welfare of her citizens, their prosperity will always be cherished by me with fervent and affectionate regard. EPHRAIM BEACH, *Civil Engineer.*

The Coal Trade for 1838.

The following is the quantity of Coal shipped from the different regions in 1837 and 1838:—

	1837.	1838.
Schuylkill,	523,152	431,719
Lehigh,	192,595	152,699
Lackawanna,	115,387	78,207
Beaver Meadow,	33,617	44,966
Hazleton,		14,221
Laurel Hill,		2,001
	864,751	723,813

Decrease in 1838, 140,938 tons.

The consumption of Coal, as near as can be ascertained, was in

		Annual increase.
1831	177,000	
1832	329,000	150,000
1833	413,000	84,000
1834	457,000	41,000
1835	556,000	100,000
1836	682,000	126,000
1837	664,000	decrease.

The consumption for last year, owing to the ruinous effects of the Government experiments on the currency, causing a general depression of business, and the almost total cessation of the manufacturing operations throughout the country, being about 20,000 tons less than the preceding year. This produced a consequent dullness in the coal trade the past season, which has been almost ruinous to those engaged in it. The quantity on hand at the opening of the navigation in 1838, over and above last year's consumption at all the different depots, has been estimated at 200,000 tons; this may probably supply the deficiency of this year's trade, and allow for the resumed operation of the manufactories. For if to the supply of this year 723,813 tons, we add the 200,000 surplusage of the last, we have in market 923,813 tons to meet the demand, giving 254,000 tons over and above the consumption of last year. This quantity, should the winter continue as severe as it has set in, and the manufactories continue their operations, will probably be all consumed before the opening of the navigation next spring.—*Miner's Journal.*

The Effects of the Recent Freshet on most of our large rivers, though very destructive on our various improvements, have proved less so than was imagined. The damage was mostly done to bridges, and those portions of railroads passing over inundated swamps. From its exposure in that respect, much injury was sustained by that portion of the Baltimore and Philadelphia Railroad, between Philadelphia and Wilmington. This however, is, we understand, rapidly undergoing the necessary repairs.

The Convention of Civil Engineers is at present in session in Baltimore. We shall lay before our readers the earliest intelligence of their proceedings.